Learning Objective

8.PS.6 Represent problem situations

Solve equations by using the Division and Multiplication Properties of Equality.

Do Now:

GET READY for the Next Lesson

PREREQUISITE SKILL Multiply. (Lesson 1-6)

36. $3(9)$ **37.** $-2(18)$ **38.** $-5(-11)$ **39.** $4(-15)$

QUICK REVIEW

Factor out the expression $x^2 - 5x + 6$

ANSWER: $(x-2)(x-3)$

On the lines below, explain how you found your answer.

When you multiply -2 and -3 you get +6. You get -5x because you -2x and -3x.

1-10 Solving Multiplication and Division Equations

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MINI - LESSON

GET READY for the Lesson

TRANSPORTATION High speed trains are very popular in Europe and Asia and can travel at speeds of 150 miles per hour or more. That's almost three times the speed of a car on the highway!

1. If h represents the number of hours the train has traveled, write a multiplication equation you could use to find how long it would take the train to travel 675 miles.

Hour	Distance
1	150(1) = 150
2	150(2) = 300
3	150(3) = 450
⋮	⋮
h	?

The equation $150h = 675$ models the relationship described above. To undo the multiplication of 150, divide each side of the equation by 150.

EXAMPLE Solve a Multiplication Equation

1 **Solve $150h = 675$.**

$150h = 675$	Write the equation.
$\frac{150h}{150} = \frac{675}{150}$	Divide each side of the equation by 150.
$1h = 4.5$	$150 \div 150 = 1$ and $675 \div 150 = 4.5$
$h = 4.5$	Identity Property; $1h = h$

CHECK Your Progress

Solve each equation. Check your solution.

a. $8x = 72$ **b.** $-4n = 28$ **c.** $-12 = -6k$

In Example 1, you used the **Division Property of Equality** to solve a multiplication equation.

Division Property of Equality

Key Concept

Words If you divide each side of an equation by the same nonzero number, the two sides remain equal.

Examples

Numbers	Algebra
$12 = 12$	$5x = -60$
$\frac{12}{4} = \frac{12}{4}$	$\frac{5x}{5} = \frac{-60}{5}$
$3 = 3$	$x = -12$

Reading Math

Division Expressions

Remember, $\frac{a}{-3}$ means *a divided by* -3.

You can use the **Multiplication Property of Equality** to solve equations.

Multiplication Property of Equality

Key Concept

Words If you multiply each side of an equation by the same number, the two sides remain equal.

Examples

Numbers	Algebra
$5 = 5$	$\frac{x}{2} = 8$
$5(-4) = 5(-4)$	$\frac{x}{2}(2) = 8(2)$
$-20 = -20$	$x = 16$

EXAMPLE Solve a Division Equation

2 Solve $\frac{a}{-3} = -7$.

$\frac{a}{-3} = -7$	Write the equation.
$\frac{a}{-3}(-3) = -7(-3)$	Multiply each side by -3.
$a = 21$	$-7 \cdot (-3) = 21$

CHECK Your Progress Solve each equation.

d. $\frac{y}{-4} = -8$

e. $\frac{m}{5} = -9$

$5\left(\frac{m}{5}\right) = (-9)5$

$m = -45$

f. $30 = \frac{b}{-2}$

$-2(30) = \left(\frac{b}{-2}\right)-2$

$-60 = b$

Real-World EXAMPLE

3 **REPTILES** An adult lizard is about 5 times as long as a hatchling. If an adult lizard is 11 centimeters long, about how long is a hatchling?

Words	Adult length is 5 times hatchling length.
Variable	Let g represent the length of a hatchling.
Equation	$11 = 5 \cdot g$

$11 = 5g$	Write the equation.
$\frac{11}{5} = \frac{5g}{5}$	Divide each side by 5.
$2.2 = g$	$11 \div 5 = 2.2$

A lizard hatchling is about 2.2 centimeters long.

CHECK Your Progress

g. **METEOROLOGY** The recorded amount of precipitation is one-tenth the amount of fallen snow. If Redfield, New York, received 13.6 inches of precipitation in one week, how many inches of snow fell?

x = snow fallen

$$\frac{10}{1}\left(\frac{1}{10}x\right) = (13.6)\frac{10}{1}$$

$$x = 136$$

CHECK Your Understanding

Solve each equation. Check your solution.

1. $5b = 40$
2. $-7k = 14$
3. $-18 = -3n$
4. $\frac{p}{9} = 9$
5. $\frac{a}{12} = -3$
6. $22 = \frac{m}{-2}$
7. **FUNDRAISING** King Middle School is selling cards as a fundraiser and receives $\frac{3}{4}$ of the proceeds. Write and solve a multiplication equation to find how much they need to sell in order to raise $1,350.

HOMEWORK

Practice and Problem Solving

#11-2
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Show all work on
looseleaf

HOMEWORK

#11-2

HOMEWORK HELP

For Exercises	See Examples
8–13	1
14–19	2
20, 21	3

Solve each equation. Check your solution.

8. $4c = 44$
9. $9b = 72$
10. $34 = -2x$
11. $36 = -18y$
12. $-32 = 8d$
13. $-35 = 5n$
14. $\frac{m}{7} = 10$
15. $\frac{u}{9} = 6$
16. $\frac{h}{-3} = 33$
17. $20 = \frac{q}{-5}$
18. $-8 = \frac{c}{12}$
19. $\frac{r}{24} = -3$

20. **MAMMALS** A koala eats an average of 2.5 pounds of leaves from eucalyptus trees each day. If a small tree has 30 pounds of leaves on it, write and solve a multiplication equation to find how many days the leaves will last.

21. **SCHOOL ACTIVITIES** The drama club sold 1,200 tickets for the school musical. If the total ticket sales were $6,000, write and solve a multiplication equation to find the cost per ticket.

MEASUREMENT For Exercises 22–26, refer to the table. Write and solve an equation to find each quantity.

Customary System Conversions (capacity)
1 tablespoon = 3 teaspoons
1 cup = 16 tablespoons
1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts

22. the number of cups in 96 teaspoons
23. the number of cups in 64 tablespoons
24. the number of gallons in 24 quarts
25. the number of gallons in 120 pints
26. the number of gallons in 128 fluid ounces

Solve each equation.

27. $7 = \frac{-56}{z}$
28. $\frac{10}{x} = -5$
29. $\frac{-126}{a} = -21$
30. $-17 = \frac{136}{g}$